Contents

Preface vii

PART 1: ALGEBRA: IDEAS AND ISSUES

1. Reshaping School Algebra: Why and How? 1
Peggy A. House, University of Minnesota, Minneapolis, Minnesota

2. Conceptions of School Algebra and Uses of Variables 8
Zalman Usiskin, University of Chicago, Chicago, Illinois

3. Children's Difficulties in Beginning Algebra 20
Lesley R. Booth, James Cook University of North Queensland, Townsville, Queensland, Australia

4. Teaching Algebraic Expressions in a Meaningful Way 33
Louise Chalouh, Protestant School Board of Greater Montreal, Montreal, Quebec, Canada
Nicolas Herscovics, Concordia University, Montreal, Quebec, Canada

5. Difficulties Students Have with the Function Concept 43
Zvia Markovits, Weizmann Institute of Science, Rehovot, Israel
Bat Sheva Eylon, Weizmann Institute of Science, Rehovot, Israel
Maxim Bruckheimer, Weizmann Institute of Science, Rehovot, Israel

PART 2: READINESS FOR ALGEBRAIC CONCEPTS

6. Establishing Fundamental Concepts through Numerical Problem Solving 61
Franklin Demana, Ohio State University, Columbus, Ohio
Joan Leitzel, Ohio State University, Columbus, Ohio

7. Algebraic Instruction for the Younger Child 69
Frances M. Thompson, Texas Woman's University, Denton, Texas

8. Proportionality and the Development of Prealgebra Understandings 78
Thomas R. Post, University of Minnesota, Minneapolis, Minnesota
Merlyn J. Behr, Northern Illinois University, DeKalb, Illinois
Richard Lesh, WICAT Systems and Northwestern University, Evanston, Illinois

PART 3: EQUATIONS AND EXPRESSIONS IN ALGEBRA

9. Two Different Approaches among Algebra Learners 91
Carolyn Kieran, Université du Québec à Montréal, Montreal, Quebec, Canada

10. An Integration of Equation-solving Methods into a Developmental Learning Sequence 97
John E. Bernard, West Georgia College, Carrollton, Georgia
Martin P. Cohen, University of Pittsburgh, Pittsburgh, Pennsylvania

11. Polynomials in the School Curriculum 112
Theodore Eisenberg, Ben-Gurion University, Beer Sheva, Israel
Tommy Dreyfus, Center for Technological Education, Holon, Israel

PART 4: PROBLEM SOLVING IN ALGEBRA

12. Teaching Elementary Algebra with a Word Problem Focus 119
Harold L. Schoen, University of Iowa, Iowa City, Iowa

13. From Words to Algebra: Mending Misconceptions 127
Jack Lochhead, University of Massachusetts, Amherst, Massachusetts
José P. Mestre, University of Massachusetts, Amherst, Massachusetts

14. Developing Algebraic Representation Using Diagrams 136
Martin A. Simon, Mount Holyoke College, South Hadley, Massachusetts
Virginia C. Stimpson, Mercer Island High School, Mercer Island, Washington

PART 5: USING COMPUTERS AND CALCULATORS TO LEARN ALGEBRA

15. Technology and Algebra 142
John W. McConnell, Glenview South High School, Glenview, Illinois

16. Computer Software for Algebra: What Should It Be? 149
Harley Flanders, University of Michigan, Ann Arbor, Michigan

17. Programming Finite Group Structures to Learn Algebraic Concepts 152
Richard J. Shumway, Ohio State University, Columbus, Ohio

18. Relating Functions to Their Graphs 155
James Saunders, Upper St. Clair High School, Upper St. Clair, Pennsylvania
John DeBlassio, Upper St. Clair High School, Upper St. Clair, Pennsylvania

19. Computer Lessons in Algebra 158
Patricia Fraze, Huron High School, Ann Arbor, Michigan

20. Computer-calculated Roots of Polynomials 164
Alfinio Flores, Centro de Investigación en Matemáticas, Guanajuato, Mexico

21. Computer-generated Tables: Tools for Concept Development in Elementary Algebra 170
M. Kathleen Heid, Pennsylvania State University, University Park, Pennsylvania
Dan Kunkle, Mercersburg Academy, Mercersburg, Pennsylvania

22. Using Spreadsheets in Algebra Instruction 178
Bruce R. Maxim, University of Michigan—Dearborn, Dearborn, Michigan
Roger F. Verhey, University of Michigan—Dearborn, Dearborn, Michigan

23. Using Computer Graphing Software Packages in Algebra Instruction 181
Joyce S. Friske, Oklahoma State University, Stillwater, Oklahoma

24. Logarithms, Calculators, and Teaching Intermediate Algebra ... 185
Betty J. Krist, D'Youville College, Buffalo, New York

PART 6: ALGEBRA TEACHING IDEAS

25. Factoring Twins as a Teaching Tool 192
Lee H. Minor, Western Carolina University, Cullowhee, North Carolina

26. An Algebra Class Unveils Models of Linear Equations in Three Variables 199
Deborah Davies, University School of Nashville, Nashville, Tennessee

27. Common Mistakes in Algebra 204
June Marquis, Fairfax County Public Schools, Alexandria, Virginia

28. Using Polynomials to Amaze 206
Catherine Herr Mulligan, Bishop Fenwick High School, Middletown, Ohio

29. Teaching Absolute Value Spirally 212
Alex Friedlander, Weizmann Institute of Science, Rehovot, Israel
Nurit Hadas, Weizmann Institute of Science, Rehovot, Israel

30. Which One *Doesn't* Belong? 221
David J. Glatzer, West Orange Public Schools, West Orange, New Jersey

31. Integrating Statistical Applications in the Learning of Algebra through Problem Solving 223
Carolyn A. Maher, Rutgers University, New Brunswick, New Jersey
John P. Pace, Essex County College, Newark, New Jersey
John Pancari, St. Joseph High School, Hammonton, New Jersey

32. Input-Output Modifications to Basic Graphs: A Method of Graphing Functions 229
John S. Thaeler, Weber State College, Ogden, Utah

33. Making Algebra Homework More Effective 242
Gregory Holdan, Mount Lebanon School District, Pittsburgh, Pennsylvania

34. Algebra Problems for Classroom Use 248
Terry Goodman, Central Missouri State University, Warrensburg, Missouri
Martin P. Cohen, University of Pittsburgh, Pittsburgh, Pennsylvania